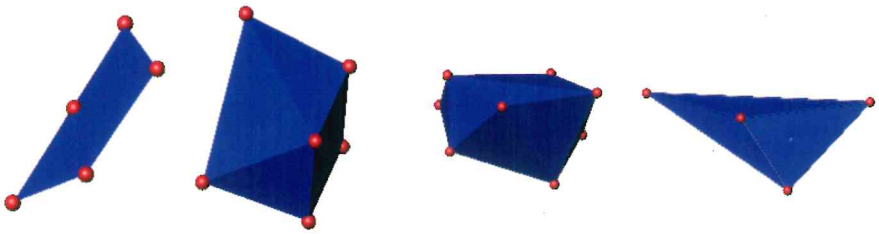
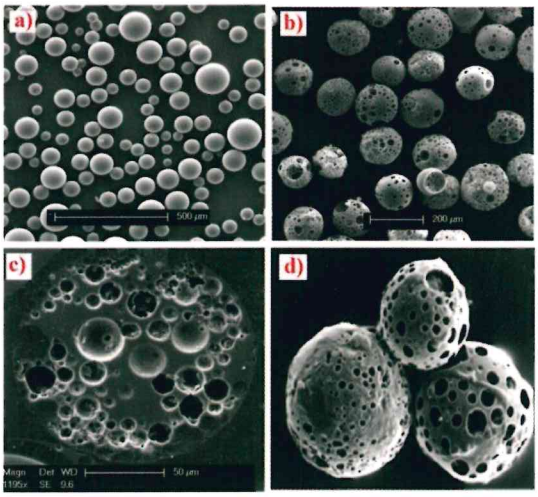
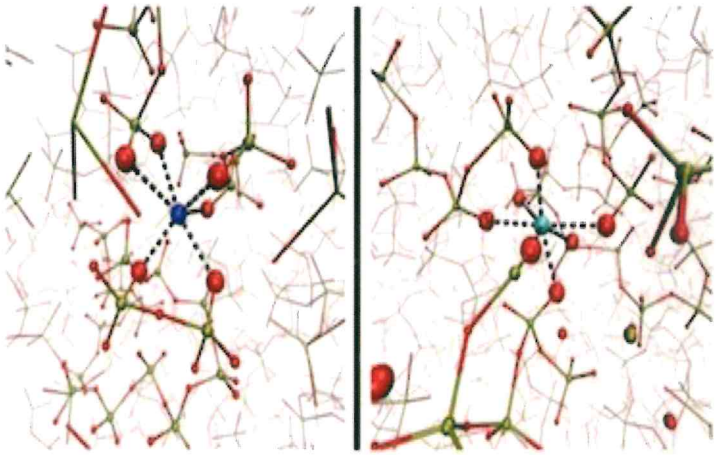
Synthesis and characterization of innovative Er^3+-doped nanoparticles containing phosphate glasses and glass ceramics

BORATE GLASSES, CRYSTALS AND MELTS:

Ninth International Conference







PHOSPHATE MATERIALS:

Second International Conference

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24 – 28 July 2017

Synthesis and characterization of innovative Er^{3+}-doped nanoparticles containing phosphate glasses and glass ceramics

Pablo Lopez-Iscoa[1], Laeticia Petit[2**], Jonathan Massera[3], Davide Janner[1], Nadia G. Boetti[4], Diego Pugliese[1] & Daniel Milanese[1,5]*

[1]*Department of Applied Science and Technology, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy*
[2] *nLIGHT Corporation, Sorronrinne 9, FI-08500 Lohja, Finland*
[3] *BioMediTech, Tampere University of Technology, Korkeakoulunkatu 3, 33720 Tampere, Finland*
[4]*Istituto Superiore Mario Boella, Via P. C. Boggio 61, 10134 Torino, Italy*
[5]*IFN - CNR, CSMFO Lab., Via alla Cascata 56/C, 38123 Povo (TN), Italy*
** *now at Laboratory of Photonics, Tampere University of Technology, Korkeakoulunkatu 3, 33720 Tampere, Finland*

Recently, glass ceramics (GCs) have attracted a growing interest because their luminescence may be increased due to the crystalline environment around the Rare Earth (RE) ions. These materials are able to combine glass properties with some advantages of RE-doped single crystals (e.g., higher absorption/emission cross-sections and longer lifetimes).

In this presentation, we report on the synthesis of biocompatible phosphate GCs using direct doping of particles into the glass melt and glass ceramics methods. The first approach is based on the incorporation of already synthesized erbium-doped NPs into the glass host followed by successive melt-quenching. Different synthesis routes of NPs have been explored and compared. Structural, optical and spectroscopic characterizations allowed assessing the occurrence and the properties of the erbium-doped NPs in the glasses. The second approach leverages the nucleation and growth of crystals from the amorphous phase, which were characterized in terms of chemical composition as reported in Fig. 1. The effect of the addition of Al_2O_3, TiO_2 and ZnO on the crystallization behavior and on the structural, optical and luminescence properties of erbium-doped phosphate glasses is discussed. These results pave the way toward the development of new bioactive fiber sensors and lasers for healthcare applications.

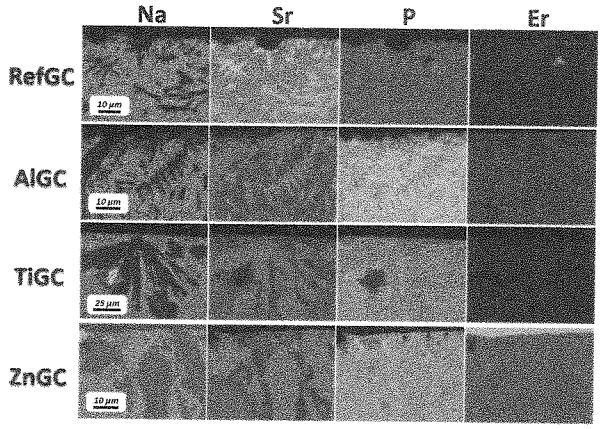
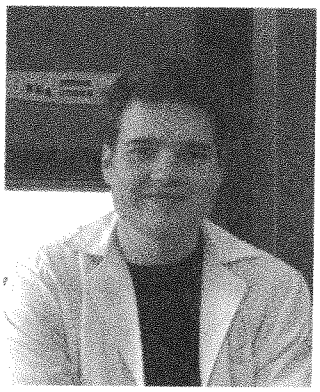


Figure 1 – EDS maps of the different fabricated GCs

The project leading to this result has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 642557.



I am currently a Marie Curie Fellow within the European Training Network CoACH. I am in my second year of Ph.D. in Materials Science and Technology at the Politecnico di Torino, Italy.

In 2013 I received my Degree in Pharmacy from the Complutense University of Madrid, Spain. After that, I worked until 2015 with a FPI fellowship at the Institute of Ceramics and Glass (ICV), a research centre belonging to the Spanish National Research Council (CSIC). My work consisted in the synthesis and characterization of rare earth-doped $LaPO_4$ nanoparticles.

In 2015 I started my Ph.D. within the framework of the CoACH programme. My project is being carried out at Politecnico di Torino and at n-Light, Finland, among other institutions. The aim of this project is to design, synthesize and characterize innovative erbium-doped phosphate glasses and glass ceramics for photonic and biomedical applications.